



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2020
CEMACOR10T-CHEMISTRY (CC10)

Time Allotted: 2 Hours

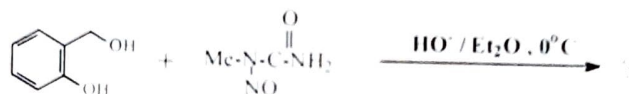
Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer any *four* questions taking *one* from each unit

Unit-I

1. (a) Nitriles undergo both acidic and alkaline hydrolysis but isonitriles are hydrolysed only by acids. Explain with mechanism. 2
- (b) Give the product with plausible mechanism explanation of the following reaction. 2



- (c) Carry out the following conversions. 2



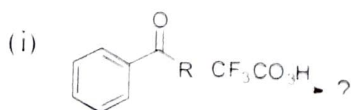
2. (a) Compare the reactions of aniline, N-methyl aniline and N,N-dimethylaniline towards benzenesulfonyl chloride and aq. KOH. How can you utilize this reaction for the separation of primary, secondary and tertiary amines? 2

- (b) How can you chemically distinguish between 4-nitro toluene and PhCH₂NO₂? 2

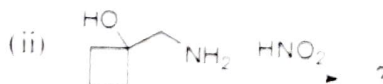
- (c) How can you convert aniline into 1, 2, 3-tribromobenzene? 2

Unit-II

3. (a) Identify the products in the following and show the plausible mechanism involved. 2+2

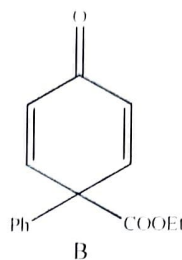
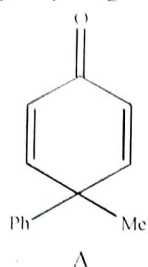


Case I R= 'Bu
Case II R= Me



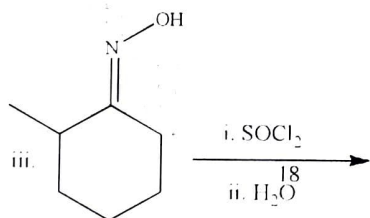
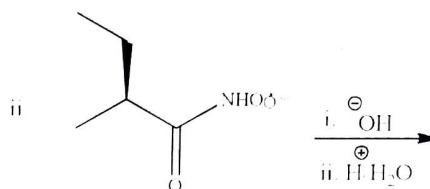
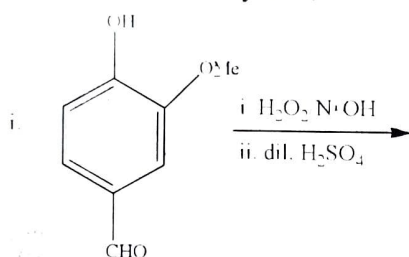
(b) Explain the following observations.

- (i) In the dienone-phenol rearrangement of compound A the phenyl group migrates but in the dienone-phenol rearrangement of compound B the $-\text{COOEt}$ group migrates.

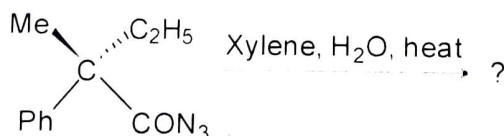


- (ii) In the Hofmann degradation of RCONH_2 a small amount of CO(NHR)_2 and RNHCONHCOR are produced along with R-NH_2 .

4. (a) Predict the products in the following reactions and formulate plausible mechanism for their formation. (any *two*). 2+2



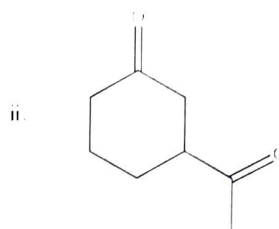
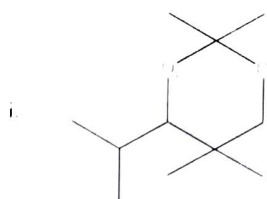
- (b) Predict the product (with proper stereochemistry) in the following reaction with suitable mechanistic explanation. 2



- (c) Two isomeric α -halo ketones **A** and **B** on treatment with NaOMe (separately) gave the same product $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{Me}$. Identify **A** and **B**. 2

Unit-III

5. (a) Analyse the following molecules retro synthetically and suggest plausible synthetic route to them. $2\frac{1}{2} + 2\frac{1}{2}$



(b) Give synthetic equivalent for the following species. 2



(c) Predict the major product of the following reaction with proper stereochemistry. 2



(d) Which combination of reagents is appropriate for the following transformation? 1



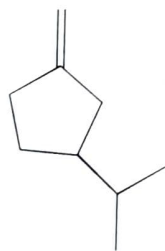
6. (a) Synthesize the following compound using Diels-Alder reaction one of the key step. 2



(b) Explain with proper example: Illogical Nucleophile, Functional Group Addition. 3

(c) Show disconnection of hexane-2,4-dione in terms of consonant and dissonant polarities. 2

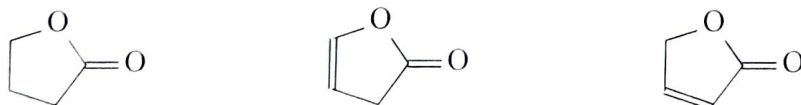
(d) Outline a synthesis of the following molecule showing logical retro synthetic analysis. 3



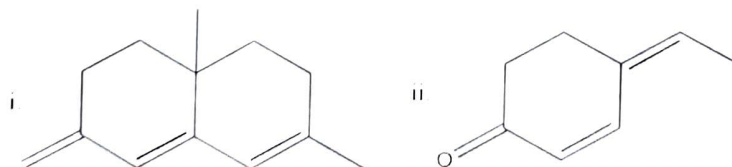
Unit-IV

7. (a) Concentrated solutions of C_2H_5OH and $HOCH_2CH_2OH$ have broad O-H bands near 3350 cm^{-1} . On dilution with CCl_4 , the spectrum of ethylene glycol does not change but that of the alcohol shows a sharp peak at 3600 cm^{-1} replacing the band at 3350 cm^{-1} . Provide a suitable explanation in support of this observation. 3

(b) Arrange the following compounds in order of increasing carbonyl stretching frequencies with proper explanation. 2



(c) Calculate λ_{max} values for the following compounds using Woodward Fieser rule. 2+2



- (d) Compound B ($C_3H_6Cl_2$) displays the following spectroscopic data. 4
 UV : $\lambda_{max}(\epsilon_{max})$: Transparent above 210 nm
 IR (cm^{-1}) : 2950, 1270, 690.
 1H -NMR : δ (ppm) 1.25 (d, 3H, J 7 Hz), 3.6 (m, 1H), 3.2 (dd, 2H, J 7 Hz, 11 Hz).
 Deduce the structure of compound B and explain the spectroscopic data as far as practicable.
- (e) Toluene is oxidised to benzaldehyde. What changes would you expect in PMR spectral feature for the product with respect to that of the starting material? 2
- (f) Mention one solvent, other than $CDCl_3$, that acts as NMR-solvent. 1
8. (a) $PhCOCH_3$ gives two isomeric oximes. Both of them are separately treated with conc. H_2SO_4 to give the products **A** and **B** respectively. Identify the products on the basis of IR spectroscopy. 3
- (b) An organic compound of molecular formula, $C_9H_{10}O_2$ showed three peaks in the PMR spectrum as given below: δ 1.96, singlet, 3H; δ 5.0, singlet, 2H and δ 7.2, singlet, 5H. One of the intense IR bands of this compound appears at 1740 cm^{-1} . Deduce the structure of the compound and explain the spectral data. 3
- (c) Account for the following observations. 2+2+2
- (i) Although sp carbon is more electronegative than sp^2 carbon, alkenyl protons appear at higher δ value than alkynyl protons in 1H -NMR spectrum.
- (ii) Stretching of aldehydic C-H appears as a doublet and at higher wave number than alkenyl C-H.
- (iii) Homoannular dienes absorb at higher wavelength than heteroannular dienes.
- (d) 'C=C' stretching frequency of cyclobutene is at 1566 cm^{-1} but that of 1-methylcyclobutene is at 1641 cm^{-1} . Account for this observation. 2
- (e) What is bathochromic shift in UV spectroscopy? Explain with a suitable example. 2

N.B. : Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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